

REMARKS

By this amendment, Applicant has amended claims 1 and 2 to further define the invention. In particular, claims 1 and 2 have been amended to recite that the separation column is “configured to receive” the methanol water mixture and the sample from the auto-sampler and “configured to separate” the sample comprising nitropolycyclic aromatic hydrocarbons into at least four separate nitropolycyclic aromatic hydrocarbons, and the reduction column is “configured to receive” the at least four separate nitropolycyclic aromatic hydrocarbons and “to aminate” the separate in nitropolycyclic aromatic hydrocarbons. Applicants have also added dependent claims 17 and 18 to further define the apparatus as including an ultrasonic generator. See, e.g., paragraph bridging pages 5 and 6 of Applicant’s Substitute Specification.

The Examiner has objected to the specification in numbered section 4 of the Office Action as failing to proper antecedent basis for the claimed subject matter. In support of this, it has been urged that the separation column specifically designed to separate a sample into four specific isomers of nitro-PAH lacks antecedent basis. Applicant traverses this objection and requests reconsideration thereof.

The present claimed invention relates to an apparatus for analyzing nitrocyclic aromatic hydrocarbons and includes a separation column configured to separate the sampling containing nitropolycyclic aromatic hydrocarbons into at least four separate nitropolycyclic aromatic hydrocarbons. It is noted the claims no longer call for a separation column to separate a sample into four specific “isomers.” Support for the claims as

presently amended, including the presently claimed separation column, can be found at, e.g., the third full paragraph on page 6 of the Substitute Specification.

Accordingly, reconsideration and withdrawal of the objection to the specification in numbered section 4 of the Office Action are requested.

Claims 1 and 9 stand rejected under 102(b) as allegedly being anticipated by JP 2001-021497 to Iwabuchi et al. Claim 15 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi et al. Applicant traverses this rejection and requests reconsideration thereof.

The rejected claims relate to an apparatus for analyzing nitropolycyclic aromatic hydrocarbons. The apparatus includes an auto-sampler to which a methanol water mixture and a sample comprising nitropolycyclic aromatic hydrocarbons are sent; a separation column downstream of the auto-sampler configured to receive the methanol water mixture and the sample from the auto-sampler and configured to separate the sample containing nitropolycyclic aromatic hydrocarbons into at least four separate nitropolycyclic aromatic hydrocarbons including 1-nitropyrene, 1,3-dinitropyrene, 1,6-dinitropyrene and 1,8-dinitropyrene; a reduction column downstream of the separation column configured to receive the at least four separate nitropolycyclic aromatic hydrocarbons including 1-nitropyrene, 1,3-dinitropyrene, 1,6-dinitropyrene and 1,8-dinitropyrene from the separation column and to aminate the separated nitropolycyclic aromatic hydrocarbons; and a fluoresce detector. See claim 1. The apparatus can also include an analysis column for separating an interfering component contained in the sample from the aminated separated

nitropolycyclic aromatic hydrocarbons (see, claim 2).

As described at the paragraph bridging pages 2 and 3 of Applicant's Substitute Specification, the Iwabuchi et al. publication discloses a nitrogen-containing organic substance analyzer comprising a reduction column for reducing the nitrogen-containing organic substance, a separation column for separating the nitrogen-containing organic substance, a means for adding a reaction reagent to the reduced and separated nitrogen-containing organic substance for causing chemiluminescence emission for detection, and a means for setting the reduction column arbitrarily to a temperature within the range of 90 to 150° C., so that the nitrogen-containing organic substance is reduced within the temperature range of 90 to 150° C.

The Office Action appears to equate the reduction column 17 of Iwabuchi et al. to the reduction column of the present invention. However, it appears the reduction column 17 of Iwabuchi et al. reduces the nitroarene from separation column 9. Based on the English abstract of Iwabuchi et al., it appears the polycyclic aromatic component from separation column 9 is sent to a separation column 10, not to the reduction column 17. Thus, it does not appear the reduction column 17 of Iwabuchi et al. is configured to receive at least four separate nitropolycyclic aromatic hydrocarbons from the separation column and to aminate the separated nitropolycyclic aromatic hydrocarbons.

For the foregoing reasons, it is submitted the presently claimed invention is patentable over Iwabuchi et al.

Claims 1, 9 and 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the article Li et al. Applicant traverses this rejection and

requests reconsideration thereof.

The Li et al. article discloses that the determination of mono- and di-nitro polycyclic aromatic hydrocarbons (PAHs) was accomplished by on-line reduction to the corresponding amino PAHs, which were then separated and detected using high-performance liquid chromatography (HPLC) and chemiluminescence detection. On page 179 of this article, chromatograms are shown in which 2(A) is a chromatogram of a standard mixture. Peaks: 1 = 1,8- dinitropyrene, 2 = 2-nitroanthracene, 3 = 1-nitropyrene, 4 = 6-nitrocrysene, 5 = 3-nitroperylene and 6 = 1-nitroperylene, (B) and (C) are chromatograms of a diesel particulate extract from fractions containing mono-nitro PAHs and di-nitro PAHs, respectively, and (D) and (E) are chromatograms of a diesel exhaust emission filter extract sample from fractions containing mono-nitro PAHs and di-nitro PAHs, respectively.

While the introduction of Li et al. mentions that “great attention has been directed to 1-nitropyrene and 1, 3-, 1, 6- and 1,8-dinitropyrenes,” it does not appear that the Li et al. article discloses a separation column for separating a sample comprising nitropolycyclic aromatic hydrocarbons into at least four separate components including 1-nitropyrene, 1,3-dinitropyrene, 1,6-dinitropyrene and 1,8-dinitropyrene. Rather, in Li et al, the nitro PAHs are first reduced to amino PAHs using a catalyst column (see, the section 2.3 bridging pages 178 and 179 of Li et al). It is the amino PAHs that are separated by chromatographic separation (see, section 2.4 on page 179 of Li et al). Accordingly, the Li et al. article does not disclose and would not have rendered obvious the presently claimed invention including a separation

column configured to separate a sample containing nitropolycyclic aromatic hydrocarbons into at least four separate nitropolycyclic aromatic hydrocarbons including 1-nitropyrene, 1,3-dinitropyrene, 1,6-dinitropyrene and 1,8-dinitropyrene.

Moreover, the separation column in Li et al. is not disclosed to be a silica gel/C8 separation column, as now recited in claims 15 and 16.

The present invention also includes an auto-sampler to which a methanol water mixture and the sample comprising nitropolycyclic aromatic hydrocarbons are sent. The separation column is configured to receive the methanol water mixture and the sample from the auto-sampler. On the other hand, in Li et al., the methanol water mixture and the sample are sent first to the catalyst column. It is disclosed that “[b]ecause the methanol-water solution is not appropriate to the chemiluminescence detection system, it is necessary to change to an acetonitrile-buffer solution as mobile phase by using a switch valve.” The chromatographic separation of the amino compounds is then carried out in Li et al. using the acetonitrile-buffer solution; the chromatographic separation column does receive the sample and methanol water mixture from an auto-sampler.

Moreover, according to the present invention, the reduction column is configured to aminate the separated nitropolycyclic aromatic hydrocarbon is downstream of the separation column. The opposite is true in Li et al. On-line reduction using a catalyst column is first carried out and then chromatographic separation is carried out downstream of the catalyst column.

For the foregoing reasons, the apparatus of the present invention is

clearly not disclosed and would not have been obvious from Li et al.

Moreover, neither Iwabuchi et al. nor Li et al discloses or would have rendered obvious the apparatus for analyzing nitropolycyclic aromatic hydrocarbons set forth in new dependent claims 17 and 18, including an ultrasonic generator provided upstream of the auto-sampler for applying ultrasonic waves to a mixture of diesel particulates and an organic solvent to dissolve soluble organic fractions of the diesel particulates in the organic solvent.

In view of the foregoing amendments and remarks, favorable reconsideration and allowance of all the claims now in the application are requested.

Please charge any shortage in the fees due in connection with the filing of this paper, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 648.45478X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

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